

PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA



PLANTERS' BULLETIN TWENTYNINE

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LOCATION. The institute's laboratories and offices are at the third mile, Ampang Road, Kuala Lumpur. The institute is open from 8 am to 1 pm and 2 pm to 4 pm on Mondays to Fridays, and from 8 am to 12.30 pm on Saturdays.

CORRESPONDENCE. All LETTERS must be addressed to the Director, Rubber Research Institute of Malaya, Post Office Box 150, Kuala Lumpur. Special inquiries may be marked for the attention of particular officers. The address for TELEGRAMS is Searching, Kuala Lumpur. TELEPHONE: Kuala Lumpur 3351. PARCELS occasionally arrive without any indication of their origin. Senders' names and addresses should be written clearly on the outside of all packages, and the institute should be advised of despatch by letter or telegram.

PROHIBITED PLANT SPECIMENS. Attention of planters and others in territories outside the Federation of Malaya and the Colony of Singapore is drawn to the Malayan Plant Importation Rules which prohibit the importation into Malaya of any part of a plant, whether living or dead, unless it is accompanied by a permit issued by the Director of Agriculture, Federation of Malaya. No permit will be issued in respect of any diseased plant or any plant pest. Any plant imported in contravention of these Rules (whose object is to prevent the introduction of diseases or pests) will be destroyed without examination. Anyone outside Malaya who desires our advice on any matter that may require examination of living material must first inquire by letter.

ADVICE. Inquiries are invited from rubber producers in the Federation of Malaya, the Colonies of Singapore and North Borneo, and the territories of Sarawak, Brunei and Nigeria, who may require more detailed information applicable to their own special problems. Where it is considered necessary, visits will be made to estates in Malaya as convenient. Visits to estates in other territories are by special arrangement. The only visits for which charges are normally made are those of the institute's budding mandores. INTERVIEWS should be arranged by letter or telephone, as members of the senior research and advisory staff are frequently absent on visits to plantations.

EXPERIMENT STATION AND FACTORY. This station of the R R I is situated 16 miles from Kuala Lumpur, at Sungei Buloh on the Kuala Lumpur — Kepong — Kuala Selangor road. Visits may be made on Mondays or Wednesdays by arrangement. There is a guest house.

PUBLICATIONS. Subscription to all or any of our series of publications (*Planters' Bulletin*, *Journal*, *Reports*, and miscellaneous booklets) may be made by depositing \$15 with us. An annual statement of account will then be submitted.

PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

Kuala Lumpur

March 1957

Number 29

Editorial: Schedule III Cess

In the complex of duties and cesses payable on rubber exported from Malaya appears a constant item of half of a cent per pound which has been variously designated as the Rubber Regulation Cess, the Malayan Rubber Fund Cess and quite commonly but mistakenly as the R.R.I. Cess. There would appear to be a good deal of confusion about the origin of the cess and the objects for which its revenue is now used.

The cess was originally introduced under the Rubber Regulation Enactment (Federated Malay States Enactment No. 17 of 1934) in order to provide funds for the operation in Malaya of the international rubber regulation scheme. At the time it was introduced it became known as the Rubber Regulation Cess; the amount of the cess was varied in accordance with the cost of administration of the rubber regulation or 'restriction' scheme. As a matter of administrative convenience the cess included provision for the cost of research and technical services for the industry, and from the proceeds of the cess the Controller of Rubber, who was appointed under the enactment, provided the funds required for the operation of the Rubber Research Institute of Malaya, the British Rubber Producers' Research Association and the British Rubber Development Board in the United Kingdom. Thus, in its original form the Rubber Regulation Cess provided the revenue of the Malayan Rubber Fund, which was established for the following purposes:

- a* the payment of all expenses in connection with the administration of the enactment and of any purpose related thereto;
- b* the payment of such expenses of the International Rubber Regulation Committee as the Federated Malay States might be liable to contribute;
- c* the payment of contributions to the Rubber Research Institute of Malaya;
- d* the furtherance of rubber research, the improvement of the rubber industry and the support of propaganda relating to rubber;
- e* such other purposes as the Federal Council might by resolution approve.

The International Rubber Regulation Agreement came to an end in April 1944, but the legislation under which the Malayan Rubber Fund was established and provided with its revenue has remained in force. Of its original objectives the only ones remaining are the provision for research, technical, and propaganda services for the betterment of the industry. Thus the original Rubber Regulation Cess - the 'R.R. Cess' -

Editorial: Schedule III Cess

has come to be regarded solely as a cess for research and is quite often referred to by planters as the 'R.R.I. Cess.' It seems desirable that the actual situation should be more generally known.

Schedule III cess of 0.5 cents per pound is the Malayan Rubber Fund cess. The objects for which its revenues are now used are shown in the accounts of the Rubber Fund for the year 1955 published in the Federation of Malaya Government Gazette (No. 2370 of 18 October 1956). This financial statement shows the following distribution of revenue during 1955:

	\$	%
A. Total net income, 1955	7,030,427	100
B. Allocation of expenditure		
<i>i</i> Rubber Research Institute of Malaya	3,207,177	45.6
<i>ii</i> British Rubber Producers' Research Association	1,301,361	18.5
<i>iii</i> Natural Rubber Development Board	1,419,994	20.2
<i>iv</i> Rubber Producers' Council of the F. of M.	103,366	1.5
<i>v</i> Administration and sundry expenditure	25,681	0.4
C. Balance, to reserves	972,848	13.8

The functions of the principal organisations which are financed from the Malayan Rubber Fund may be broadly and briefly described as follows:

R.R.I. of Malaya - To carry out research on the problems of production of natural rubber, improvement of planting material, tapping practices, cultivation and maintenance procedure and the control of pests and diseases of rubber. To undertake research on the product, embracing improvement in methods of processing latex and dry rubber for the market, and the discovery and development of new forms of natural rubber. To provide information, by means of comprehensive advisory services, relevant to all problems of production, both for estates and smallholders.

B.R.P.R.A. - To engage in research on natural rubber and latex in order to assist the producer to meet and maintain consumer demands for natural rubber and to seek new outlets and new uses for natural rubber and modified forms of the natural product.

N.R.D.B. - To keep in close touch with the developments in the rubber manufacturing industry and to foster the use of natural rubber by publicity and technical information on the uses of natural rubber in all industrial applications.

Prior to the foundation in 1934 of the Malayan Rubber Fund, money for research was provided by a tax which was levied at varying rates on rubber exported from Malaya, commencing in 1928. The whole of the cost of research, as well as other related expenditures, is now derived from the Malayan Rubber Fund, which is fed by the 0.5 cent per pound cess on rubber which is produced in, and exported from, Malaya.

Tapping Young Rubber—

Revised Recommendations

LARGE ACREAGES OF YOUNG CLONAL SEEDLING and budded planting material are due to come into tapping in the near future. We have collected much information from our experiments on this high yielding material, and three major considerations have led us to revise our tapping recommendations:

- 1 Alternate daily tapping of clonal seedlings on a half spiral cut (S/2. d/2. 100%) usually results in a high brown bast incidence.
- 2 Tapping towards a junction of bark of different ages leads to a severe drop in yield.
- 3 Bark of second renewal is often thin and yield from it is disappointing.

High yielding trees are more prone to brown bast than low yielders. The yield capacity of individual trees in a stand of seedlings, clonal or unselected, varies greatly. A survey made in a field of clonal seedlings at our Experiment Station showed the following distribution:

1% of all trees gives			4% of the total yield of the field		
2%	"	"	7.5%	"	"
5%	"	"	16%	"	"
10%	"	"	27%	"	"
15%	"	"	37%	"	"
20%	"	"	44%	"	"
50%	"	"	77%	"	"
75%	"	"	92%	"	"
100%	"	"	100%	"	"

If brown bast cases occur mainly amongst the highest yielding trees, it follows that the proportion of crop lost through resting the affected trees is higher than the proportion of trees rested.

A brown bast incidence of 15 to 20% has been found in several of our clonal seedling trials. From the table it is seen that this could mean a loss of about 40% of crop if only the highest yielders had been affected. Where there is a large number of dry trees many additional trees may be found whose panels are partially dry and which continue to yield at a reduced rate.

When clonal seedlings are tapped third daily the brown bast incidence rarely rises above 5%. The immediate loss in yield on this system is known to be 20 to 25% compared with alternate daily tapping, but this difference decreases as time progresses, mainly because of the higher brown bast incidence on alternate daily tapping but also because of better girdling of the trees on third daily tapping. Our prewar experiments showed this trend but were discontinued before completion. New experiments are in hand.

The clones recommended by us for large or medium scale planting (*Planters' Bulletin* 28) are not or are only slightly susceptible to brown bast, except clone Glenshiel 1 which, we advise, should be tapped third daily on half spiral throughout its life. The recommended clones can be tapped alternate daily on a half spiral cut without risking a high brown bast incidence.

Tapping Young Rubber

Gentle handling of young budded rubber by tapping it third daily during the first three or four years of tapping is advocated in some quarters. Figures from some pre-war experiments show slightly better girthing on S/2 . d/3 . 67% tapping, but this was at most never more than 20% better than the girthing on S/2 . d/2 . 100% tapping and in several instances no differences have been observed. Assuming the higher figure of 20% and a mean annual girth increment of 2 inches on S/2 . d/2 . 100% tapping, the gain in girth would be 1.6 inches during the first four years of S/2 . d/3 . 67% tapping at the expense of a yearly loss of some 20% of the crop which could have been obtained on S/2 . d/2 . 100% tapping.

There is at present no evidence that trees which have been tapped at 67% intensity during the first four years would girth better on later 100% tapping than trees which were tapped S/2 . d/2 . 100% throughout. It would take at least fifteen years of subsequent 100% intensity tapping before the initial loss in yield by tapping four years at 67% intensity was compensated for by the increased length of the tapping cut. We therefore recommend that at times of profitable rubber prices buddings ought to be tapped S/2 . d/2 . 100% from the time of opening and that only when the yield per tapper becomes more important than the yield per acre should 67% tapping be adopted.

It is well known that when the tapping cut approaches a junction of bark of different ages the yield decreases markedly. This situation should therefore be avoided if possible. When the renewed bark is thin, a new cut is often opened some 10 inches above the renewing panel. We now know that this policy is a waste of bark reserves and results in a low yield. It does not contribute appreciably to bark renewal on the panel underneath.

On budded trees, therefore, we consider that the first cuts should be opened as high as the tapper can reach, and a new cut should never be opened above the top of the old panel except in ladder tapping. The ideal would be to start tapping budded trees from the moment they reach tappable size at say 80 inches from the union. This would give 32 years of tapping on virgin bark and bark of first renewal, and the only junction of different bark types would be at the union of stock and scion. However, without close supervision, such high tapping on young trees is apt to be rough and bark consumption may be excessive. A practicable height of opening for budded trees is 50 to 60 inches from the union, which gives 20 to 24 years of tapping on virgin bark and bark of first renewal.

The conical shape of the stems of seedlings makes tapping at low level attractive because of the greater length of the tapping cut and the thicker bark. Our earlier recommendations for seedlings were to open the first panel at 20 inches from ground level, the second at 30 inches at the opposite side of the tree, the third at 40 inches, and the fourth at 40 inches. The third panel is thus 20 inches above the first, and the fourth 10 inches above the second.

We now recommend that the first panel be opened at 20 inches and the second at 40 inches on the opposite side. All subsequent panels should then be opened at 40 inches. By this change in recommendation one of the junctions of bark of different ages is avoided.

The two reasons for opening trees as high as is practicable are that high cuts allow longer tapping on virgin and first renewal bark before tapping the lower yielding second renewal bark, and that junctions of bark of different ages are avoided.

NEW TAPPING RECOMMENDATIONS

Seedling trees—A half spiral cut should be opened at 20 inches from ground level when 70% of the trees in the area to be tapped have reached a girth of 22 inches at that height. Tapping should be third daily (S/2 . d/3 . 67%).

The second and subsequent panels to be opened at 40 inches from ground level. We suggest third daily tapping throughout, but if it is decided to tap alternate daily after some four years of third daily tapping, the trees should be brought back to third daily tapping as soon as more than 10% of the stand shows signs of brown bast. The length of the tapping cut of partially dry trees should be reduced when tapping is alternate daily. Dry trees on third daily tapping should be rested for 6 months.

Budded trees—A half spiral cut should be opened at between 50 to 60 inches from the union when 70% of the trees have reached a girth of 20 inches at the height of opening. Tapping should be alternate daily throughout (S/2 . d/2 . 100%) except on clone Glenshiel 1 (and other clones susceptible to brown bast) which should be tapped third daily.

Subsequent panels should be opened at the same height as the first.

Dowpon—Lalang and Grass Eradicator

THAT DOWPON WAS ONE OF THE MOST EFFECTIVE and promising of grass eradicator yet given trial under Malayan conditions was intimated by our article 'A New Weedkiller for Control of Grasses' in *Planters' Bulletin* 23 (page 27). Our further investigations over the past twelve months confirm the initial promise of Dowpon (formerly Dalapon) and we are now in a position to make recommendations.

In the earlier stage of our investigations we thought that slashing before spraying might be more effective than Dowpon application to the standing lalang; we hoped that this would reduce the amount of Dowpon—much more costly than sodium arsenite—needed to secure effective control. In one experiment in which the lalang, *Imperata cylindrica*, was allowed to regenerate to a height of twelve to eighteen inches before spraying, 80 lb of Dowpon per acre secured a complete kill but some new growth was apparent at the 40 lb rate three months after spray application. Another experiment, designed to study the comparative efficiency of Dowpon on slashed and unslashed lalang, showed beyond doubt that the weedicide was much less effective when applied to the slashed lalang. Four months after spraying, slashed lalang plots which had received Dowpon at the rate of 40 lb per acre were showing regeneration of about 5 to 10% of the sprayed plants, whereas in the unslashed lalang plots 10 lb of Dowpon per acre was sufficient to provide the same degree of control. It is therefore much

more feasible and economic to spray standing *lalang* rather than to incur the heavier expense not only of slashing but of the larger amounts of Dowpon required for successful control. *Figure 1* illustrates the well marked effect of Dowpon (applied at the rate of 20 lb per acre) two months after spraying, on sheet *lalang*; growth is stopped and the former green foliage becomes brown or bleached. Our experiments have

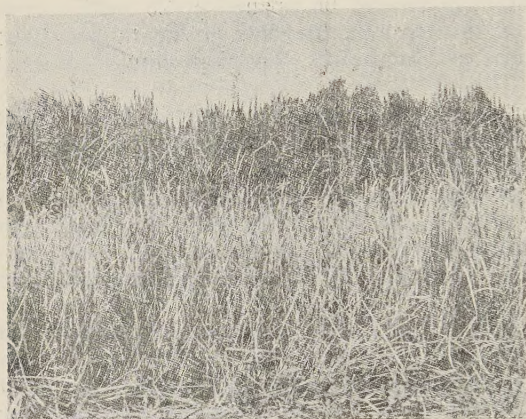


Figure 1. Lalang eradication. Plot in foreground received Dowpon, applied at the rate of 20 lb per acre, two months before photograph. Control plot in background bears vigorous, four foot tall, green lalang. Dowpon sprayed plot bears pale brown withered lalang shoots.

shown that an application of Dowpon, at the rate of 10 lb per acre, will successfully destroy standing *lalang*. If spraying is carried out under adverse conditions, as when heavy rainfall follows application, a higher dosage—say 15 lb—will be required for the same degree of control. The effect of the weedicide is not immediately obvious and as long a period as two months may pass before the maximum degree of browning and kill is obtained. We have found it possible under good conditions to ensure complete control

of standing *lalang* for a period of six months by one application of Dowpon at the rate of 10 lb per acre, followed by rounds of oil wiping four and five months after spraying.

Although Dowpon successfully eliminates *lalang*, its residual effect does not prevent the colonisation of the sprayed *lalang* areas by Siam weed, *Eupatorium odoratum*, and other broad leafed plants, especially *Borreria latifolia*. When these plants become noxious it is advisable to spray with Fernoxone, or other proprietary weedicides containing 2,4-D.

As Dowpon is relatively expensive, more than \$3 (Malayan) per pound, and although its toxicity to *lalang* may continue to be effective up to six months after spraying, it was hoped that by a preliminary spraying with sodium arsenite or chlorate the total cost of control per annum might be materially reduced. Experiments to test this idea were carried out. Dowpon at the rate of 10 lb per acre was applied to *lalang* plots, which had been sprayed three months previously with either chlorate (25 lb/acre) or arsenite (15 lb/acre). The results showed little extra effect, two months after the Dowpon spraying, over that expected from an initial spraying of Dowpon without a preceding application of either chlorate or arsenite. However, arsenite spraying prior to Dowpon spraying in areas bearing vigorous sheet *lalang* might prove advantageous in order to weaken the original stand, but the subsequent

Dowpon—Lalang and Grass Eradicator

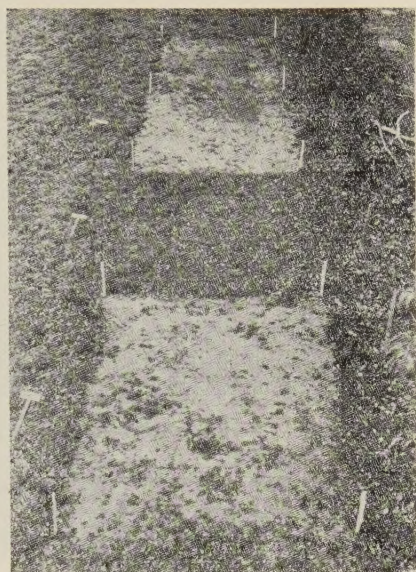
Figure 2. Grass plots (mainly *Axonopus*) nine months after spraying with Dowpon. Plot in foreground, 15 lb/acre; second plot, control, untreated; third plot, 10 lb/acre.

Dowpon application may produce no marked effect if regeneration has not been allowed to continue sufficiently to produce shoots eighteen inches tall.

Apart from its potent effect on lalang Dowpon is equally destructive of grasses, and some of its effects were described in *Planters' Bulletin* 23. Beside the grasses listed in that article, subsequent work has shown that Dowpon at the rate of 10 lb per acre is also efficient in the destruction of bamboo grass.

Ischaemum muticum; its effect was still markedly noticeable five months after spray application. However, for general estate practice the much cheaper sodium chlorate (15 lb/acre) produces almost the same effect. Figure 2 illustrates the efficiency of Dowpon against the smaller grasses.

Dowpon can be regarded as much the most efficient lalang and grass eradicator available for use in rubber plantations. It is to be noted that considerable caution is required when applying it near young rubber trees. Some of the toxic effects produced by large dosages applied as sprays along the rows of three years old trees are shown in Figures 3, 4 and 5. Severe defoliation and terminal dieback of shoots can occur when quantities of about 30 lb per acre are applied to areas growing susceptible clones. Among the more susceptible clones is LCB 1320; the less susceptible clones include PR 107 and RRIM 501. Clone Tjir 1



ranges between. Unselected seedlings (two years old) grown in nurseries at a distance of 2 feet by 3 feet also

Figure 3. Mild stages of dieback and defoliation caused by the strip spraying of Dowpon at the rate of 30 lb per acre along a row of three years old trees of clone LCB 1320. Photographed at two months after spraying.

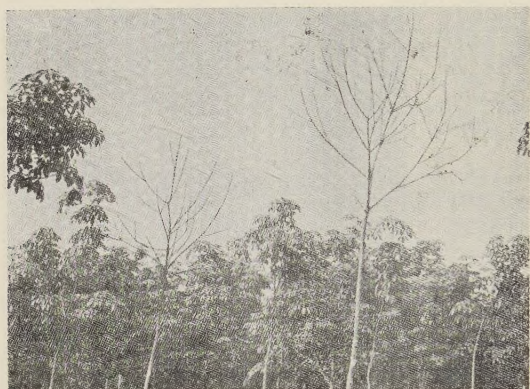


Figure 4. Complete defoliation observed in trees of same age, clone and area as shown in Figure 3, but which were of less vigorous growth and appearance. Sprayed and photographed at the same times as the tree in Figure 3.

showed signs of severe dieback when the sparse ground cover plants were sprayed with Dowpon at the rate of 30 lb per acre; slight effects were observed at the same time (five weeks after spraying) for the 15 lb rate of application. This suggests that in nurseries containing very young plants, Dowpon should not be applied in excess of 5 lb/acre; we are investigating this point.

Because of the above observations we make the general recommen-

dation that for application of Dowpon along rubber tree rows a dosage of 10 lb (or at the most 15 lb) per acre should not be exceeded. This weight should be dissolved in a volume of 100 gallons of water to which the usual amount of wetting agent has been added.

Recent trials have not confirmed earlier observations which suggested that Dowpon had a selective action on grasses but little effect on leguminous cover plants. Observations carried out six months after spraying showed that *Pueraria phaseoloides* was killed by Dowpon spraying (10 to 20 lb/acre) and that *Mikania scandens* invaded the sprayed areas. However, repeated application at two month intervals of small dosages of Dowpon (2 to 5 lb/acre) may not injure legumes but may prevent vigorous establishment of grasses amidst the legume stand.

Dowpon should secure a large degree of control over sedges (*Scleria* spp) and may then be the only weedicide effective against these often pernicious weeds. Correspondents have also claimed a considerable control of bracken at a dosage of 15 to 20 lb of Dowpon per acre.

Figure 5. Severe defoliation and dieback observed in trees of clone Tjir 1 strip sprayed along the rows with Dowpon at the rate of 60 lb per acre. Photographed two months after spraying.



Decaying Timber Spreads Root Disease

A SAPROPHYTE IS USUALLY DEFINED as an organism that obtains its food from dead organic matter, a parasite as one that feeds on living tissue. The terms parasite and disease are often associated. Strict application of these definitions would, however, exclude many disease producing fungi from the category of parasites. This apparent paradox has a simple explanation. Microscopic examination of a diseased plant sometimes shows that tissue is dead beyond the area penetrated by the parasite. Fungi causing disease in this manner secrete toxic compounds that diffuse into the



Figure 1. A three foot length of rubber tree trunk lying on the ground, two months after felling.

host tissue ahead of the advancing hyphae. Such a fungus feeding on dead tissue is, by definition, a saprophyte.

As might be expected, many fungi which attack thus can exist in a purely saprophytic phase by colonising suitable moribund or dead tissue which then acts as a reservoir of infection causing disease when a suitable host plant touches it. The persistence of such fungi in the saprophytic phase is limited by the amount of suitable food available and by the competition for it from purely saprophytic fungi which are often at a competitive advantage.

The pathogenic saprophytic mode of existence described above is common to all three major root disease fungi of rubber — *Fomes lignosus*, *Fomes*

Figure 2. The underside of the trunk in Figure 1 washed to remove debris and showing rhizomorphs and resupinate fructifications of *Fomes lignosus*.

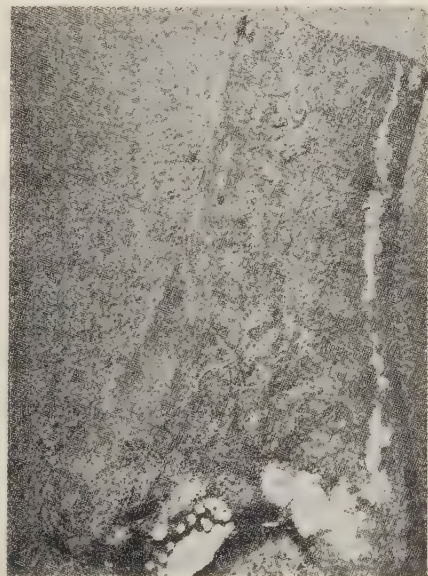




Figure 3. Vertical view of the soil beneath the trunk shown in Figure 1. The white patches are rhizomorphs and mycelium of *F. lignosus*.

noxius and *Ganoderma pseudoferreum*. As well as infecting living plants these fungi can also colonise moribund and dead

wood. This fact is of practical importance because woody material so colonised can transmit disease to healthy roots that come in contact with it, exactly as when a healthy root touches an old diseased stump or the roots of a diseased tree. Colonisation may be initiated, either by the fungal mycelium growing out of already infected wood into moribund wood nearby, or by wind blown spores produced in the fungal fruit bodies. Fruit bodies may be found all the year round; therefore the air must always contain spores of these pathogens. Fortunately the spores do not infect uninjured trees. Their 'infecting potential' is not sufficient to overcome host resistance or to penetrate the barrier of saprophytes present in the outer dead cells of the bark. Infection started by spores of *F. noxius* has, however, been observed to cause branch dieback after a foothold has been gained on untreated or badly pruned snags.

The spores of *F. noxius*, *F. lignosus* and *G. pseudoferreum* can gain a hold on the surface of exposed wood of a newly felled tree. The fungal mycelium spreads downwards through the stump into the tap root and laterals to be halted only when it reaches wood that has already been colonised by other organisms. Stumps thus invaded represent a hazard to the young stand in

Figure 4. Surface soil of Figure 3 removed to a depth of four to six inches to show infected roots that had transmitted the disease to the tree trunk.



Decaying Timber Spreads Root Disease

a replanting exactly as do any other stumps of trees previously infected by root disease. When a stump has been left after cutting out a tree for any reason — thinning, lightning damage, wind breakage — it may, if colonised by these pathogens, initiate a new disease patch in what was otherwise a healthy stand. This phenomenon may explain many cases attributed in the past to dormant sources of infection.

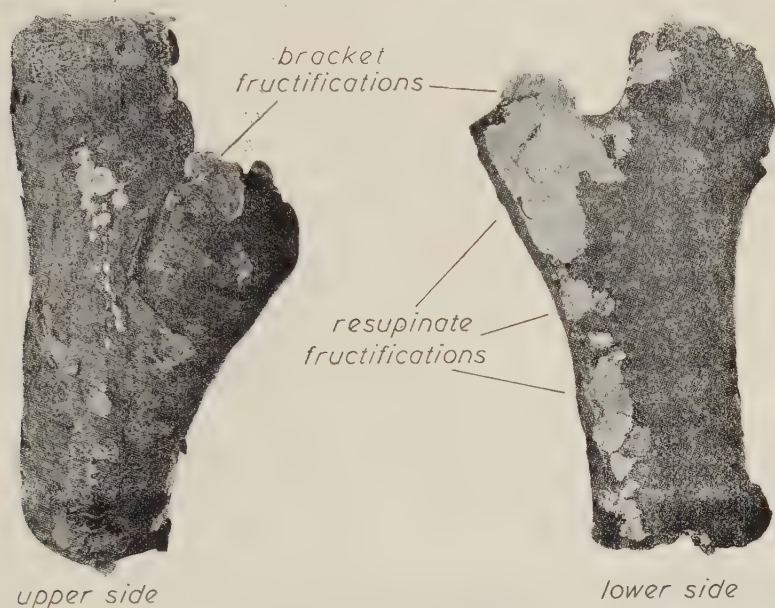


Figure 5. Underside of the same trunk as in Figure 1 five months later. It had been removed from the site. The additional development of fructifications proves that the timber was well colonised and that the growth shown in Figure 2 was not just superficial. Resupinate (flat) fructifications are common on the lower surface of old infected timber but are rarely seen by the casual observer because of their position.

Inevitably, if the newly cut surfaces of stumps can be colonised by spores, then the corresponding surface of the trunk can be similarly invaded. Field observations show that this can occur. An interesting outbreak of brown root disease was recorded before the war at our Experiment Station. Many cases of *F. noxius* were found where budded plants had become infected from supporting stakes cut from branches of nearby jungle and rubber trees. The only possible explanation of how these stakes become sources of infection is that the exposed wood surface had been colonised by spores. The under surface of timber left on the soil after pruning wind damaged trees, or cutting out brown bast trees for instance, frequently carries the typical brown velvety mycelium of *F. noxius*. Transmission of the disease from such timber to a root in the soil close to it has been observed and, as with stumps colonised by spores, may partly explain cases of suspected dormancy.

Decaying Timber Spreads Root Disease

It should be noticed that reference has been made to 'cut surface' or 'exposed wood' whilst discussing the phenomenon of spore colonisation. The reason for this emphasis is that such surfaces, when first exposed, are sterile. The spores of the root disease fungi — fungi which are specifically adapted to invading living wood — can gain a foothold there because they have to compete only with the spores of non-parasitic wood destroying saprophytes. In such a situation, the latter fungi cannot invade until the tissue is nearly dead.

If colonised timber can transmit the disease to a root in contact with it, then the reverse might be expected to happen — a diseased root transmitting the fungus to freshly felled timber. It does happen, and has been observed quite frequently with *F. lignosus*. That it has been observed mainly with this fungus is because its rhizomorphs can, to a limited extent, spread through soil independently of roots. Thus direct contact between infected and uninfected material is not necessary for *F. lignosus* to pass from one to the other.

Field observations show that the two methods of saprophytic colonisation described above may markedly increase disease incidence in a replanting. Colonisation of stumps by spores of *G. pseudoferreum*, or of surface timber left after felling by rhizomorphs of *F. lignosus*, can be of considerable importance in areas where these fungi are prevalent.

Apart from the direct transmission of disease described above, infected surface timber may markedly increase disease incidence in a replanting through the agency of uncontrolled creeping covers. Under the cool moist conditions beneath a good cover, surface timber infected by *F. lignosus* may produce a luxuriant growth of rhizomorphs



Figure 6. Part of a disease patch initiated when spores of *F. noxius* colonised the stump of a tree cut out after wind damage; the remnant of its stump is shown at A. The tree at B became infected from A by root contact and was cut out. The tree at C has been pollarded ready to fell. The trees marked X are infected as are five others not shown in the photograph.

which spread rapidly in the mulch and along the lower stems of the creepers. If strip or circle weeding is not practised, the covers being allowed to form a dense mat round the base of the tree, then the fungus has direct and easy access to the most vulnerable part of the tree — its collar. In one of our field experiments, sited in an area where a lot of surface timber had been left, strip weeding was stopped after the fifth round of collar inspection. Six months

Decaying Timber Spreads Root Disease

later, at the next round of inspection, the incidence of disease was twice that of the fifth round and three times as great as had been anticipated if weeding had been continued. This gives a striking illustration of what was pointed out in *Planters' Bulletin 14* (page 100), that covers must be kept away from the trees in areas where root disease is active.

Although we now have quite a lot of evidence as to the importance of the saprophytic phase of the root disease fungi, we need still more. Root disease experiments are long term projects requiring four or more years to give results. Much evidence of value can be gained more quickly by gathering information under less well controlled conditions but over greater areas. To this end we seek the cooperation of estate managements. Especially interesting are replantings where the old rubber has been felled and the trunks of the trees left on the ground. We would welcome information from estates about these, and the opportunity to make observations in them, whether or not the surface timber is believed to be transmitting disease.

Replanting and Malaria

With the approach of the main malarial season, April to July, we have been fortunate in securing for our readers an article by the Secretary of the Malaria Advisory Board, Federation of Malaya.

THERE NEVER WAS A TIME when there was less malaria on estates than there is today. The change from the bad malaria years before the war has been astonishing, and to utter warnings about malaria now is to risk being dismissed as a Jeremiah, prophesying gloom for gloom's sake. But a moment's reflection will show that we dare not forget about malaria, for its decline must be due to some reason, either to control measures, or to a natural ebbing the cause of which is not understood.

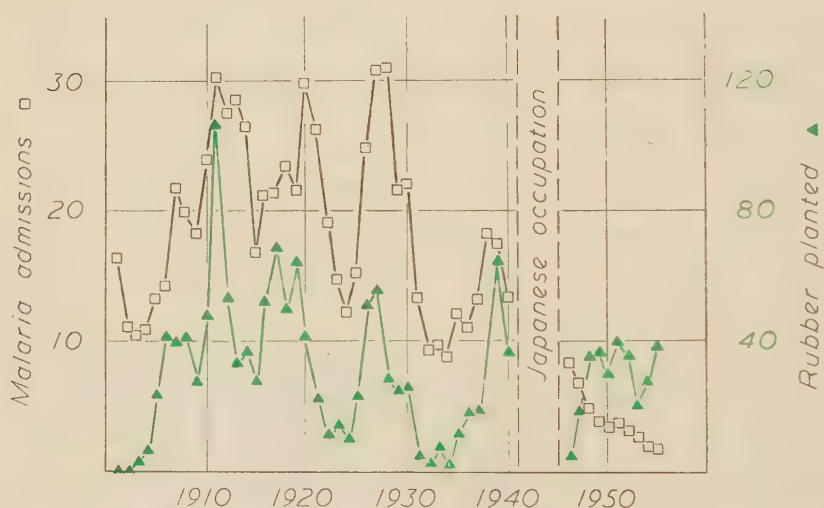
If control measures are responsible, then sooner or later malaria will return if control is stopped. The outbreak in Kuala Lipis in 1953 is a clear example. Due to terrorist activity one segment of the town's malaria control area was neglected by the oiling gangs, and the result was an outbreak of several hundred cases of malaria in the town. If, on the other hand, the decline in malaria is an unexplained natural event, then we must assume that the disease can also increase again, perhaps when it is least expected.

If the decline is attributed to some unknown natural factor there is no firm basis on which to act or persuade others to act. In point of fact, however, there is much evidence that control measures are the main reason for the decline in malaria, because on the whole it has not declined where there has been no control. For example, wherever measurements have been made in distant kampongs where there has never been any control, the disease has been just as intense as before the war. This is hardly surprising; there is no reason why malaria should have changed when nothing else in these kampongs has changed. The wisest course therefore is to assume that the decline in malaria

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on estates is largely due to control measures, because this gives us a tangible reason on which to plan and act.

However, there is one puzzle that must be explained before we can accept this assumption. If control measures are the main cause of the decline, then why are they so much more successful now compared with pre-war years? The difference is striking; for example in 1938 there were 22,244 malaria cases treated in estate hospitals alone in the Federated Malay States. In these four States (Perak, Selangor, Negri Sembilan and Pahang) in 1955, there were only 1,503 malaria admissions to estate hospitals — less than seven per cent of the 1938 figure — and admissions to both government and estate hospitals for the population of the entire Federation of Malaya in 1955 totalled only 8,577. Admittedly 1938 was a bad year for malaria, but even in 1933, which was an unusually good year, admissions to estate hospitals in the F.M.S. alone were about 9,500.



Replanting and malaria 1900-55 in Perak, Selangor, Negri Sembilan and Pahang. Number of admissions for malaria per thousand of population is shown for government hospitals only. Planting and replanting are given in thousands of acres, for estates only. The data for this diagram have certain limitations, which are discussed in the Annual Report of the Malaria Advisory Board for 1955.

This puzzle, of the difference in effectiveness of malaria control measures on estates before the war and since, can probably be explained largely by differences in the control measures themselves. Before the war most estates relied on weekly oiling of a half mile circle round the lines, and it has to be admitted that where breeding of the vector mosquito *Anopheles maculatus* was intense, oiling, however carefully applied, could not prevent an appreciable amount of malaria from occurring. Since the war, estates have relied largely on suppressive drugs like paludrine: these are very efficient if taken properly, and their action is independent of the intensity of vector mosquito breeding.

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This could explain the striking fact that replanting caused so much malaria before the war but virtually none since, as is clearly shown by the graph. Oiling could not cope with the huge increase in the breeding of *A. maculatus* caused by replanting on hilly land; often the cleared areas where the mosquito was breeding so intensely were well beyond the usual half mile oiling circle. But the drugs, provided they are taken properly, are unaffected in their action by any increase in numbers of the mosquito.

If this suggestion is correct, then it follows that populations living near replanting areas in hilly land, but not protected by drugs nor having drugs readily available, may be in considerable danger of epidemic malaria. Such populations are mainly those of the kampongs, for they are usually unprotected by drugs or any other means; furthermore they already have the seed of malaria among them, from which an epidemic can rapidly spring as the result of a sudden increase in the number of vector mosquitoes, and do great damage before news reaches the understaffed and overworked Health Department.

The replanting which thus threatens the health of kampung populations may be that of nearby estates, or it may be their own, carried out under the smallholders' replanting scheme. Possibly their own replanting is the greater danger as it is likely to be closest to them, and may be carried out by felling, and not by the modern poisoning methods. The significance of this difference in replanting method is explained later. There is no doubt, however, that replanting on estates can also menace nearby kampongs. One of the worst epidemics of kampong malaria on record was largely due to replanting on nearby estates. This was the 1940 epidemic in the Rembau district of Negri Sembilan, in which malaria killed many people and caused an enormous amount of sickness and hardship.

The same thing could happen again today, though the fact that estates mainly employ modern poisoning methods in replanting perhaps diminishes the risk somewhat. Before the war old rubber was usually felled and uprooted, involving soil disturbance, blockage of streams, and a sudden change from shade to sunlight, all of which encourage intense breeding of *A. maculatus*. The new replanting methods of poisoning the old trees so that they decay slowly where they stand, while the young trees and cover crops grow in between, causes a less abrupt change of conditions and there is the minimum of soil disturbance and interference with drainage.

If replanting on estates can be a danger to nearby kampongs the reverse is also true, and smallholders' replanting on kampong land could menace the health of nearby estates. 'Nearby' in this context means within about a mile, for when *A. maculatus* is breeding intensely, sufficient numbers can fly a mile to cause epidemic malaria. Estates and kampongs can therefore do each other serious harm by replanting (or by any other clearing operations), though estates, having the knowledge and means to protect themselves, ought to suffer less. Replanting and new planting programmes, whether on estates or in kampongs, ought always to be reported to a Health Officer or estate medical practitioner as appropriate, and these two officers should keep one another informed.

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The fact that drugs seem to have played a major part in the great reduction of malaria on estates since the war, despite an active replanting programme which would certainly have provoked serious malaria before the war, does not mean that anti-mosquito measures should be abandoned; they should not. The disadvantage of drugs is that people get tired of taking them, and they don't prevent mosquitoes from breeding; but they can prevent epidemic malaria far more quickly and completely than any anti-mosquito measure. But in the absence of an epidemic and where the breeding of malarial mosquitoes is not too intense, then oiling and sanitation round the lines to keep down nuisance as well as malarial mosquitoes, combined with house spraying with DDT or other long lasting insecticide to deal with malarial mosquitoes flying in from beyond the oiled area, are suggested as preferable to the long continued use of suppressive drugs. No hard and fast rules can be laid down: the antimalarial measures best suited to any particular estate can only be decided in the light of the local circumstances, and with the advice of the estate medical practitioner. The principles on which a decision can be based, and a good deal of other information, will be found in *Malaria Control by Modern Methods**.

J.A. REID

Correspondence

The Editor invites letters of general interest for publication in this column. Comment and queries arising from articles recently published will be welcome.

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MALFORMATION OF STEM

In *Planters' Bulletin* 27, page 111, appears a photograph of a rubber seed showing a malformation of stem and root. We are sorry but we cannot agree with your explanation that the malformation was due to planting in the position shown. If the seed, ungerminated, had been planted in this position there would not necessarily have been any malformation. We think the seed shown was germinated with the flat face downwards and later

planted with the flat face upwards.

In our experience a rubber seed should be planted just as it was germinated. We have had cause to regret when managers have ignored this and have strictly adhered to the dictum that 'seed should always be planted horizontally, with the flat face downwards'.

Harrisons & Crosfield (M) Ltd

J. Brown

Director

We agree that if a seed has been germinated for any length of time it should be planted in the same position as it germinated. Our Botanical Division maintain, however, that a newly germinated seed should be planted with the flat face downwards.

* obtainable for 50 cents post free from the Secretary, Malaria Advisory Board, Institute for Medical Research, Kuala Lumpur. Similarly available are *The Anopheles of Malaya* (price \$1), and *The Transmission of Malaria in Malaya* (price \$5) by E.P. Hodgkin, formerly Entomologist of the Institute for Medical Research.

Prewar R.R.I. Publications

Those of our publications prior to 1941, of which we hold more than a token stock, will henceforth be available gratis, one copy each to any applicant in Malaya who is on our mailing list. The offer will be withdrawn when surplus stock is cleared.

These publications comprise Volumes 1 and 2 of the *Quarterly Journal of the Rubber Research Institute of Malaya* (the title subsequently lost the word *Quarterly*) and the following booklets:

W.B. Haines: *The Uses and Control of Natural Undergrowth on Rubber Estates* (1940)

R.O. Bishop: *Plantation Sheet Rubber Manufacture* (1932)

Copies over and above this gratis entitlement will be charged for as hitherto (Volumes 1 and 2 of the *Journal* at \$3 each, the booklets at \$2 each)

OUR COVER SHOWS HOW DOWPON, APPLIED THREE MONTHS PREVIOUSLY AT THE RATE OF TEN POUNDS PER ACRE, HAS ERADICATED LALANG IN THE LEFT HAND PLOT. THE SHOOTS IN THE UNTREATED PLOT ARE FOUR FEET TALL.

